

REMARKS

Claims 1 - 38 are in this application and are presented for reconsideration. By this Amendment, Applicant has amended Claims 1 - 36 and added new Claims 37 and 38 to highlight the important combination of features which define over the prior art references and address the issues raised in the Office Action. Applicant thanks the Examiner for the careful reading of the application, and for providing suggestions.

Specifically, independent Claim 1 has been amended to now include some of the combination of features of dependent Claim 7. Independent Claim 7 has been amended to also include the combination of features as provided in Claim 1. Independent Claim 19 has been amended to include some of the combination of features of dependent Claim 24. Independent Claim 28 has been amended to include some of the combination of features of dependent Claim 33.

New Claims 37 and 38 include the subject matters provided in dependent Claim 36 and have been added to overcome the 35 U.S.C. §112 rejection. No new matter has been added.

By this Amendment, the Applicant has amended several claims to overcome the Examiner's rejections and respectfully makes assertions for overcoming the rejections of the outstanding Office Action dated January 26, 2005 in the following paragraphs.

Claim Rejections - 35 U.S.C. §112

Claims 1 - 36 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the following rejections have been made in the Office Action.

The Office Action stated that the phrase of "each of said sources is designed to form at least two pools" in Claim 1 is written in terms of an intended use and is vague and indefinite because it is unclear whether it requires the presence of at least two pools.

Applicant has amended Claim 1 to clarify the invention as claimed in Claim 1.

The Office Action stated that the phrase "said superficial depressions" of Claim 11 lacks proper antecedent basis.

Applicant has amended Claim 11 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the phrase "the zones where said at least two pools must be formed" of Claim 12 lacks proper antecedent basis.

Applicant has amended Claim 12 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the phrase "said incision lines" of Claim 13 and Claim 27 lacks proper antecedent basis and suggests that it should be changed to "said superficial incision lines".

Applicant has amended Claim 13 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the word "offset" in Claim 15 is unclear, and requests a further definition.

Applicant has amended Claim 15 to clarify the word "offset" as claimed in Claim 15. The meaning of this feature should be clear if reference is made to Fig.5 or 7.

The Office Action stated that the scope and meaning of the phrase "said upper surface being treated" in Claim 17 is unclear, and appears to be a recitation of intended use.

Applicant has amended Claim 17 to clarify the invention as claimed in Claim 17.

The Office Action stated that the phrase "said boat or bar is treated" of Claim 19 is unclear and appears to be a recitation of intended use.

Applicant has amended Claim 19 to clarify the invention as claimed in Claim 19.

The Office Action stated that the phrase "the region" of Claim 24 lacks antecedent basis.

Applicant has amended Claim 24 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that Claims 24 and 26 should be provided with a period at their ends.

Applicant has amended Claims 24 and 26 as suggested.

The Office Action stated that the phrase "said metal wire" in Claim 28, line 9 lacks proper antecedent basis.

Applicant has amended Claim 28 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the phrase "each of said sources is suitable for forming thereon at least two pools" of Claim 28 is written in terms of an intended use and is vague and indefinite because it is unclear whether it requires the presence of at least two pools.

Applicant has amended Claim 28 to clarify the invention as claimed in Claim 28.

The Office Action stated that the references to pools in Claims 29 - 36 are unclear, vague and indefinite because the independent Claim 28 does not actually require the presence of pools.

Applicant has amended Claim 28 to clarify the invention as claimed in Claims 29 - 36.

The Office Action stated that the phrase "the pools of liquid metal of adjacent sources", "said alignment" and "the direction of said alignment" of Claim 30 all lack antecedent basis.

Applicant has amended Claim 30 to properly provide antecedent basis for the phrase as pointed out by the Office Action. Applicant also notes that the alignment has already been discussed in the independent Claim 28. Applicant requests reconsideration of this particular rejection.

The Office Action stated that the phrase "the region" in Claim 33 lacks proper antecedent basis.

Applicant has amended Claim 33 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the phrase "said superficial depressions" of Claim 35

lacks proper antecedent basis.

Applicant has amended Claim 35 to properly provide antecedent basis for the phrase as pointed out by the Office Action.

The Office Action stated that the phrase "between 15° and 60° and preferably between 20° and 55° and even more preferably between 25° and 45°" of Claim 36 is vague and indefinite.

Applicant has added new Claims 37 and 38 to overcome the rejection.

Claim Rejection under 35 U.S.C. §103(a)

Claims 1 - 16 have been rejected as being obvious over Schonherr (U.S. Patent No. 5,321,792, the "Schonherr '792" reference, hereinafter) in view of any of the secondary references, Achtner (U.S. Patent No. 5,788,769, the "Achtner '769" reference, hereinafter), Kleyer I (U.S. Patent No. 5,179,622, the "Kleyer '622" reference, hereinafter) and DE 970246 (the "German '246" reference, hereinafter).

It is Applicant's position that the Claims 1 - 16 are not obvious in view of the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference. The present invention as claimed provides for a combination of features not taught by the prior art as a whole including the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference. For instance, there are several differences for the present invention as claimed.

First, the present invention as claimed provides for a plurality of sources, where each source includes a first surface means and a second surface means spaced apart for enhancing the molten metal adhesiveness and separating apart the two molten metal pools from one another. Thus, the two metal adhesiveness-enhanced zones provide for various possible ways of shaping or treating the surface of the source, such that at least two separate pools of molten metal are formed and such that the pools remain separate.

According to a first possible embodiment (see e.g. Figs 3 and 4), this is achieved by providing two separate depressions 41A, 41B in the top surface of the source. The two separate

depressions are fed with separate metal wires. The molten metal forms separate pools in the two depressions. The two pools are kept physically separate and cannot accidentally get into contact. The purpose of keeping the two pools separate is clearly explained in the specification.

The second possibility is to machine or to process the top surface of the source such as to form at least two separate areas of increased wettability (see e.g. Claim 26 and Fig. 9). In practice, according to current technological knowledge, this can be achieved by providing incisions on the surface of the sources. These incisions (claim 25) are preferably laser incision lines (claim 27).

The second combination of features not taught by the prior art as a whole including the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference is that each of the first and second surface zones is provided with its own metal wire delivered by a corresponding continuous delivery means.

In other words, the present invention as claimed provides for a vacuum vaporization equipment, with vaporization sources which are characterized mainly by the following features:

- A plurality of sources is arranged side by side across the machine direction, i.e. the direction along which the substrate is fed;
- Each source has at least two areas where at least respective two separate pools of molten metal are formed. The two areas may be separate depressions (41A, 41B, Figs.3, 4) or separate areas of increased wettability (41A, 41B; Fig.9)
- Each separate area of increased wettability or each separate depression is fed by a

separate wire-feeding device (51, 53, 55). These devices feed a continuous metal wire to the respective source area, such that continuous metallization can be achieved.

The combination of references of the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference fail to teach the use of sources having separate pools of molten metal thereon.

The Achtner '769 reference discloses a single evaporator boat (i.e. a source) which is provided with a plurality of transversely aligned openings 12, 12', 12", 12"". These holes are intended to reduce the cross sectional area where increased ohmic heating is desired. By locally reducing the cross-sectional area in certain points of the source the resistance is increased and thus higher heating is generated.

Between consecutive sets of aligned openings 12"" the metal 11, 11', 11" is placed. This design of the vaporization source is inconsistent with continuous wire feeding for the following reason.

As can be clearly understood from Fig.2 of the captioned application and also from Fig. 1 of the Schonherr '792 reference, continuous wire feeding is achieved by continuously unwinding a wire from a spool through a wire guiding tube 55 (Fig.2 of the application). The outlet of the tube is located above the source, near to the end of the source. The heat generated by the source irradiates the wire coming out of the tube 55 and causes the metal to melt. The exact point where melting takes place is unknown and cannot be controlled. The wire is caused to soften first and then to melt. Softening of the wire causes the wire to bend downwards due to gravity.

The distance between the wire and the source strongly influences the amount of heat received by the wire (heating is by irradiation, mainly, and therefore the amount of heating received is dependent upon the square of the distance between irradiating source and wire). All this has as a consequence that the exact point where the metal drops fall onto the vaporization boat (source) is -unknown and varies depending upon a plurality of factors.

Now, having stated that, it is quite clear that if the vaporization boat has apertures or openings therein, the metal cannot be fed continuously in the form of a wire, because the drops of molten metal might fall within the holes with clearly dramatic consequences in terms of damages to the equipment and to the substrate.

Since the boat of the Achtner '769 reference is provided with holes or apertures 12 also within the area where the metal melts, it is clearly unsuitable for use in combination with a system of continuous metal wire feeding.

This is also confirmed by the fact that the boat of the Achtner '769 reference is provided with five separate metal pools (11, 11'...). It would not be possible to arrange that large number of separate wire feeding devices for each vaporization boat.

Indeed, according to the specification of the Achtner '769 reference (see Col.3, lines 30-35), the material to be melted or evaporated is supplied in the form of five pieces of wire to these five zones. This means that the separate pieces of wire (and not a continuous wire) are placed in the five positions before closing the vaporization chamber. Afterwards, the chamber is closed, vacuum is created, the substrate starts to be fed and the sources vaporize the metal. No continuous processing can be performed, since once the single pieces of wires are

exhausted, the process has to be interrupted.

Thus, a combination of the Schonherr '792 reference in view of the Achtner '769 reference would not have been obvious for the skilled in the art, since the secondary reference cannot be used in combination with the primary reference.

Moreover, claim 1 refers to "means for delivery of metal wire to said sources", which means cannot be provided in combination with a source according to Achtner '769 reference, for the reasons set forth above. This delivery means for delivery of the metal wire provides for continuous delivery of metal wires from a metal wire spool or the like.

Additionally, there is a further reason why the source or boat of Achtner '769 reference cannot be used with a continuous wire. There is nothing in the source of the secondary reference to avoid expansion of the pools of molten metal. If a continuous wire were used to feed the source, the risk would arise of generating too large pools in the areas 11, 11', 11". These areas are not limited by any feature of the boat, and the molten metal would eventually reach the holes 12, 12', 12 "... and fall therein. If this happens the vaporization conditions would drastically and suddenly change, with a risk of damages to the equipment and destruction of the substrate.

Indeed, the boat according to the Achtner '769 reference additionally differs from the source of the invention because there are no means to define separate vaporization zones where separate pools of molten metal are formed. As one can clearly appreciate from Fig.2, the boat of the Achtner '769 reference includes a single depression 14. Conversely, according to the invention either separate depressions or separate areas with surface incisions thereon are

provided on the upper surface of the source.

The Kleyer '622 reference discloses an arrangement where two separate vaporization boats 5a, 5b are arranged in series. Between the two separate sources 5a, 5b, a cylindrical or roller-like bearing element 38 is provided. This element is supported on the correspondingly shaped semi-cup like front surfaces 10, 18 of the sources 5a, 5b (see Col. 2, lines 66; Fig.1). A similar roller-like shaped support is provided at the opposite end of each evaporator 5a, 5b, for connection to the supporting projections 15 and 16.

The object of the invention of the Kleyer '622 reference, is to provide a series of evaporator where a plurality of individual evaporators (5a, 5b) is clamped in pairs between the electrical supply lines. The purpose of the roller-shaped supports is to electrically connect the separate sources and to form a non-rigid structure. As such, there is no teaching and no motivation to combine the Kleyer '622 reference with the Schorherr '792 reference to suggest the present invention as claimed.

Thus, this reference fails to disclose a single source with separate pools of molten metal. It rather discloses series of separate sources, with an intermediate roller-like support, electrically and mechanically connecting the two sources of each pair of sources.

According to the amended Claim 1 where the source is made of a continuous boat or a single body of electrically conductive material, this reference is not obvious.

The German '246 reference discloses a source for metal vaporization, which is provided with a plurality of depressions, where separate pools of molten metal are generated.

However, the following differences should be pointed out, between the German '246

reference and the claimed subject matter:

- The source of the German '246 reference is intended to be filled in with metal at the beginning of the process, and no continuous metal feeding in form of wire unwound from a spool is provided;

- The source of the German '246 reference is arranged transversely, i.e. the various pools of a single source according to this reference are arranged along the cross direction, namely along the width of the substrate and therefore orthogonal to the substrate feeding direction. This is clearly stated on page 2, lines 102-105: referring to Fig.6 the specification clearly indicates that the direction of movement of the substrate is from the top to the bottom or vice-versa (i.e. vertical in the figure).

Thus, a source according to the German '246 reference could not be used in an equipment according to the Schonherr '792 reference. Additionally, the German '246 reference does not suggest to arrange a plurality of separate sources side-by-side in the cross-machine direction (i.e., orthogonal to the direction of feed of the substrate), and to provide each such source with two pools arranged along the longitudinal direction of the source and to individually feed each pool with a separate wire in a continuous manner.

The source of the German '246 reference is alternative to the set of transversely aligned sources of the Schonherr '792 reference and not combinable therewith.

Therefore, even a combination of the Schonherr '792 reference with the German '246 reference would fail to teach or suggest the claimed invention. Since the dependent Claims 2 - 16 also include the combination of features, the prior references as a whole also fail to

anticipate or make obvious the present invention as claimed in claims 2 - 16.

2. Continuous feeding of wire from spools or the like.

Specifically relating to claim 8, the Office Action states that the features of this claim (incisions on the surface of the source) are known from the US Patent No. 2,962,538 to Alexander. Applicant respectfully disagrees with this assessment. This additional reference provides for a vaporizing element for deposition of metals, having a body with a top depression, the depth of the body beneath the floor of the depression being at least four times the depth of the depression and the walls bounding the depression having a greater horizontal dimension than the depth of the depression.

However, the US '538 does not suggest to use incisions which are shaped and distributed such as to define two separate surface portions having high wettability, for the formation of separate metal pools. As it can be easily understood just from the drawings of the US '538, the surface of the depression there is provided with a uniform incision and no separate areas of high wettability are provided. US '538, therefore, fails to teach the core feature of the claimed invention.

Claims 17 - 27 have been rejected as being obvious over the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference.

Claim 17 as amended define over these prior art references.

The only prior art reference, which actually discloses a single source having separate depressions, is DE '246. However, as stated above, this source is designed for arrangement in

cross-machine direction, i.e. a single source has a plurality of depressions aligned along a direction transversal to the direction of advancement of the substrate.

With specific regard to the claims relating to the presence of surface incisions, the Office Action takes the position that these claims are obvious over Alexander (US'538), because this reference teaches that surface incisions increase wettability.

Applicant respectfully disagrees with this assessment. The claimed sources use surface incisions for generating separate surfaces of increased wettability. The inventive concept is not to use incisions to increase wettability within a depression of a known source (as suggested by US1538), but rather to machine the top surface of a source or boat such that it defines separate areas of increased wettability, where separate pools of molten metal are formed, without the separate molten metal pools coming into accidental contact. In one possible embodiment this is achieved by a special arrangement of incision lines on the top surface. Such idea is neither disclosed nor suggested by US '538.

Also a combination of US1538 with US769 would not result in the claimed source, because the teaching of US '538 applied to US769 would only result in a boat identical to the one of US'769 where the inner surface of the depression 14 of US769 would be provided with uniformly distributed incision lines, without any effect on a differential wettability.

Claims 28 - 36 have been rejected as being obvious over the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference.

Claim 28 includes the similar combination of features as claim 1. In addition it includes the feature that the sources are inclined with respect to the cross machine direction as well as to the machine direction (Figs 11, 12).

Applicant has now clarified independent Claim 28 such that it now includes the combination of feature where the surface structure of the boat or source has separate depressions or incisions defining separate high-wettability areas. Further, independent Claim 28 now emphasizes the feature that the wire is fed continuously from spools or the like to each separate pool.

Therefore, the same comments as made to the above independent Claim 1 apply also to Claim 28. In addition, the Office Action depends on the US '032 as the main reference and argues that there the crucibles (i.e. the sources) are inclined with respect to the direction of feed of the substrate, because the direction of feed is tangent to the process roller 18.

What is meant by the claim is indeed that the longitudinal axis of each boat or source is arranged with an inclination with respect to what is usually called the machine direction, i.e. the direction of a vertical plane arranged parallel to the web path. In the case of US '032 (Fig.1) the machine direction is the horizontal direction parallel to the drawing sheet. The same is true with respect to Fig.1 of the captioned application. This direction is indicated by FN in Figs 11 and 12.

Since the dependent claims also include the feature of the independent Claim 28, it is Applicant's position that the dependent claims also read over the prior references.

There must be some suggestion or teaching in the prior art as a whole which would lead

the person of ordinary skill in the art to provide the combination as claimed. As the prior art as a whole fails to direct the person of ordinary skill in the art toward the claimed combination, the invention should be considered not anticipated, non-obvious and thus patentable.

Therefore, Applicant finds that the Schonherr '792 reference in view of the Achtner '769 reference, Kleyer '622 reference, and the German '246 reference does not suggest the current invention and there is no suggestion or motivation to use the teachings of the references to provide the combination as claimed.

As the prior art fails to suggest the combination of features as claimed, Applicant respectfully requests that the Examiner favorably consider the claims as now presented. At this time, Applicant respectfully requests reconsideration of this application in view of the above amendments and remarks, and Applicant respectfully solicits allowance of this application.

It is applicant's position that all claims are now allowable. Should the Examiner determine that issues remain that have not been resolved by this response, the Examiner is requested to contact Applicant's representative at the number listed below.

Favorable action is requested.

Respectfully submitted
for Applicant,

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